

# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : SUMITOMO HEAVY IND LTD

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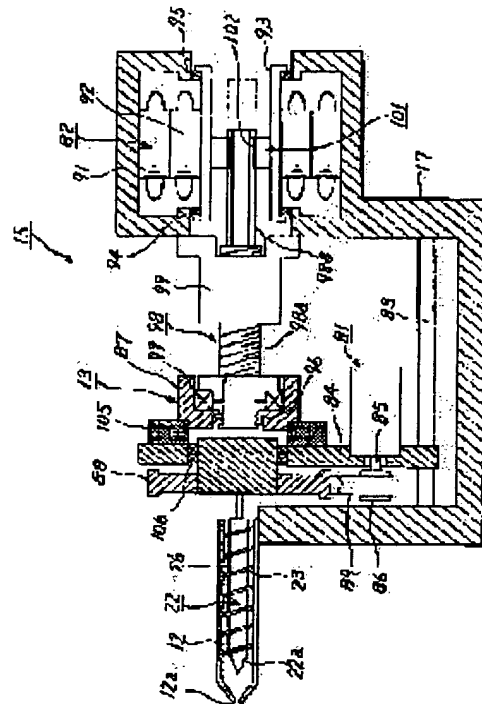
(72)Inventor : EMOTO ATSUSHI

## (54) INJECTION EQUIPMENT

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To enhance the detection accuracy of an injection force by a method wherein a load detecting means is provided between a first supporting member and a second supporting member.

**SOLUTION:** In an injection process, the rotation of an injecting motor 82 is directly transmitted to a ball screw shaft and spline shaft unit 98. In addition, an injection force developed in a screw 22 is transmitted through a driven side pulley 88 to a load cell 105 so as to be detected. Since this load cell 105 is mounted to a supporting plate 84, no torque is applied to the load cell 105 as the screw 22 and the driven side pulley 88 rotate. Further, since the load cell 105 is connected through a bearing box 13 to the ball screw shaft and spline shaft unit 98, no torque is applied to the load cell 105 as the ball screw shaft and spline shaft unit 98. Accordingly, the detection accuracy of the injection force by the load cell can be enhanced.



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CLAIMS

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[Claim(s)]

[Claim 1]An ejection device comprising:

- (a) A cylinder member.
- (b) An injection member allocated in this cylinder member enabling a free attitude.
- (c) The 1st support member that supports this injection member enabling free rotation.
- (d) A transmission shaft provided with a rotation transmitting section with which it connects with a driving means relatively to the (e) aforementioned injection member enabling free rotation and which rotation of said driving means is delivered, and a movement directional change part which changes rotational movement into a straight-line motion, (f) the 2nd support member that permits relative rotating of said injection member and a transmission shaft, and (g) — a load detecting means allocated between said 1st support member and the 2nd support member.

[Claim 2]The ejection device comprising according to claim 1:

- (a) A motor for measuring.
- (b) A transmission means which transmits rotation of this motor for measuring to said injection member.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to an ejection device.

[0002]

[Description of the Prior Art]Mold goods can be obtained now by ejecting the resin which it is heated and carried out melting into the heating cylinder in the injection molding machine with high voltage, filling up the cavity space of a metallic mold device with it (\*\*\*), and cooling and solidifying it in this cavity space conventionally.

[0003]Said injection molding machine has a mold clamp device and an ejection device, said mold clamp device is provided with a fixed platen and a movable platen, and when the cylinder for mold clamps makes a movable platen move, mold closing, eye a mold clamp, and a mold opening are performed. On the other hand, said ejection device is provided with the heating cylinder to which melting of the resin supplied from the hopper is heated and carried out, and the ejection nozzle which ejects the resin which carried out melting, and a screw is allocated in said heating cylinder, enabling an attitude free [ rotation ] and free. And by advancing this screw, resin is ejected from an ejection nozzle and measuring of resin is performed by retreating a screw.

[0004]By the way, in order to make said screw move, the ejection device of the electromotive injection molding machine which uses an electric motor is provided. Drawing 2 is a schematic diagram of the ejection device of the conventional electromotive injection molding machine. In a figure, 2 is an ejection device, 4 is an injection unit frame, the heating cylinder 21 is fixed ahead of this injection unit frame 4 (left in a figure), and the ejection nozzle 21a is allocated by the front end (left end in a figure) of this heating cylinder 21. And while the hopper 21b is allocated by said heating cylinder 21, The screw 20 is allocated in the heating cylinder 21, enabling an attitude (it moves to the longitudinal direction in a figure) free [ rotation ] and free, and the back end (right end in a figure) of this screw 20 is supported by the support member 5, enabling free rotation.

[0005]The motor 6 for measuring with a deceleration mechanism is attached to this support member 5, and rotation of this motor 6 for measuring is transmitted to said screw 20 via the timing belt 7a. While the ball screw shaft 8 is supported in parallel with the screw 20, enabling free rotation, the back end of this ball screw shaft 8 can be connected with the motor 9 for ejection with a deceleration mechanism via the timing belt 7b, and can rotate the ball screw shaft 8 by this motor 9 for ejection. And you are made to screw the front end of this ball screw shaft 8 with the ball nut 5a fixed to the support member 5. Therefore, said motor 9 for ejection can be driven and the ball nut 5a can be moved to shaft orientations by rotating the ball screw shaft 8 via the timing belt 7b. The load cell 5b is allocated between said support member 5 and the ball nut 5a.

[0006]If the rotation generated by driving the motor 6 for measuring in the ejection device 2 of said composition at the time of a metering process is transmitted to the screw 20 via the timing belt 7a, By supplying resin from the inside of the hopper 21b, while this screw 20 is retreated only to the specified quantity (it moves to the right direction in a figure), this resin is heated in the heating cylinder 21, melting is carried out, and they are \*\* (\*\*) \*\*\* to the front of said

screw 20.

[0007]If the rotation generated by driving the motor 9 for ejection at the time of an injection process is transmitted to the ball screw shaft 8 via the timing belt 7b, While said ball nut 5a and the support member 5 are advanced with rotation of said ball screw shaft 8 (it moves to the left in a figure), Said screw 20 is also advanced and the cavity space of the metallic mold device which is not illustrated from the ejection nozzle 21a is filled up with the resin collected ahead of this screw 20.

[0008]And the power, i.e., the ejection power generated on the screw 20, of advancing the ball nut 5a is detected by the load cell 5b at this time.

[0009]

[Problem(s) to be Solved by the Invention]However, in said conventional ejection device 2, since said ejection power is generated with rotating the ball screw shaft 8, the torque corresponding to the screwing angle of the ball screw shaft 8 and the ball nut 5a is added to said ball nut 5a.

Therefore, the detecting accuracy of the ejection power by the load cell 5b will become low.

[0010]This invention solves the problem of said conventional ejection device, and an object of this invention is to provide the ejection device which can make detecting accuracy of ejection power high.

[0011]

[Means for Solving the Problem]Therefore, an injection member allocated in a cylinder member and this cylinder member in an ejection device of this invention enabling a free attitude, It connects with the 1st support member that supports this injection member enabling free rotation, and a driving means relatively to said injection member, enabling free rotation, It has the load detecting means allocated between the 2nd support member that permits relative rotating of a transmission shaft provided with a rotation transmitting section which rotation of said driving means is delivered, and a movement directional change part which changes rotational movement into a straight-line motion, and said injection member and a transmission shaft, and said 1st support member and the 2nd support member.

[0012]In other ejection devices of this invention, it has further a motor for measuring, and a transmission means which transmits rotation of this motor for measuring to said injection member.

[0013]

[Embodiment of the Invention]Hereafter, it explains in detail, referring to drawings for an embodiment of the invention. Drawing 1 is a sectional view of the built in motor type ejection device in a 1st embodiment of this invention. In a figure, 12 is a heating cylinder as a cylinder member, and the ejection nozzle 12a is allocated by the front end (left end in a figure) of this heating cylinder 12. The screw 22 as an injection member is allocated in said heating cylinder 12, enabling an attitude (it moves to the longitudinal direction in a figure) free [ rotation ] and free.

[0014]And while this screw 22 has the screw head 22a in the front end, the inside of said heating cylinder 12 is extended back (right direction in a figure), and the bearing box 13 as 2nd support member is fixed to the back end (right end in a figure). The spiral flight 23 is formed in the circumference of said screw 22, and the slot 26 is formed between these flights 23.

[0015]And the resin supplying port which is not illustrated is formed in the set-up part in said heating cylinder 12, and the hopper which is not illustrated in this resin supplying port is allocated. Said resin supplying port is formed in the part corresponding to the rear end part of said slot 26 in the state where the screw 22 was put on the method of the foremost in the heating cylinder 12 (left in a figure). The heater which is not illustrated is allocated around said heating cylinder 12.

[0016]If only the specified quantity is retreated at the time of a metering process, rotating said screw 22 (it moves to the right direction in a figure), It is supplied in the heating cylinder 12 by which resin of the pellet type was heated with said heater from the inside of said hopper, and melting of this resin is heated and carried out, and it is advanced in the inside of the slot 26 (it moves to the left in a figure). And the resin made to carry out melting for one shot ahead [ of said screw head 22a ] is collected.

[0017]Next, if it is made to move forward at the time of an injection process, without rotating

said screw 22, the resin collected ahead of said screw head 22a will be ejected from the ejection nozzle 12a, and the cavity space of the metallic mold device which is not illustrated will be filled up with it. By the way, behind said heating cylinder 12, the actuator 15 for rotating said screw 22 or making it move is allocated. This actuator 15 is provided with the motor 81 for measuring allocated to the frame 17 and this frame 17 enabling free movement, and the motor 82 for ejection as a driving means fixed to said frame 17, and this motor 82 for ejection and the screw 22 are allocated on the same axis.

[0018]The guide bar 83 prolonged in parallel with said screw 22 is allocated by said frame 17, and said motor 81 for measuring is moved to it along with this guide bar 83. Therefore, while the support plate 84 as 1st support member is allocated to said guide bar 83, enabling free sliding and the motor 81 for measuring is attached to said support plate 84, the follower side belt pulley 88 is supported by the bearing 106, enabling free rotation.

[0019]The driving side pulley 86 is fixed to the output shaft 85 of said motor 81 for measuring, and the timing belt 89 is stretched between this driving side pulley 86 and said follower side belt pulley 88. And the bearing box 13 is attached to the rear face (right face in a figure) of said support plate 84 via the load cell 105 as a load detecting means. A transmission means is constituted by the driving side pulley 86, the follower side belt pulley 88, and the timing belt 89.

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**TECHNICAL FIELD**

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[Field of the Invention]This invention relates to an ejection device.

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PRIOR ART

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[Description of the Prior Art]Mold goods can be obtained now by ejecting the resin which it is heated and carried out melting into the heating cylinder in the injection molding machine with high voltage, filling up the cavity space of a metallic mold device with it (\*\*\*), and cooling and solidifying it in this cavity space conventionally.

[0003]Said injection molding machine has a mold clamp device and an ejection device, said mold clamp device is provided with a fixed platen and a movable platen, and when the cylinder for mold clamps makes a movable platen move, mold closing, eye a mold clamp, and a mold opening are performed. On the other hand, said ejection device is provided with the heating cylinder to which melting of the resin supplied from the hopper is heated and carried out, and the ejection nozzle which ejects the resin which carried out melting, and a screw is allocated in said heating cylinder, enabling an attitude free [ rotation ] and free. And by advancing this screw, resin is ejected from an ejection nozzle and measuring of resin is performed by retreating a screw.

[0004]By the way, in order to make said screw move, the ejection device of the electromotive injection molding machine which uses an electric motor is provided. Drawing 2 is a schematic diagram of the ejection device of the conventional electromotive injection molding machine. In a figure, 2 is an ejection device, 4 is an injection unit frame, the heating cylinder 21 is fixed ahead of this injection unit frame 4 (left in a figure), and the ejection nozzle 21a is allocated by the front end (left end in a figure) of this heating cylinder 21. And while the hopper 21b is allocated by said heating cylinder 21, The screw 20 is allocated in the heating cylinder 21, enabling an attitude (it moves to the longitudinal direction in a figure) free [ rotation ] and free, and the back end (right end in a figure) of this screw 20 is supported by the support member 5, enabling free rotation.

[0005]The motor 6 for measuring with a deceleration mechanism is attached to this support member 5, and rotation of this motor 6 for measuring is transmitted to said screw 20 via the timing belt 7a. While the ball screw shaft 8 is supported in parallel with the screw 20, enabling free rotation, the back end of this ball screw shaft 8 can be connected with the motor 9 for ejection with a deceleration mechanism via the timing belt 7b, and can rotate the ball screw shaft 8 by this motor 9 for ejection. And you are made to screw the front end of this ball screw shaft 8 with the ball nut 5a fixed to the support member 5. Therefore, said motor 9 for ejection can be driven and the ball nut 5a can be moved to shaft orientations by rotating the ball screw shaft 8 via the timing belt 7b. The load cell 5b is allocated between said support member 5 and the ball nut 5a.

[0006]If the rotation generated by driving the motor 6 for measuring in the ejection device 2 of said composition at the time of a metering process is transmitted to the screw 20 via the timing belt 7a, By supplying resin from the inside of the hopper 21b, while this screw 20 is retreated only to the specified quantity (it moves to the right direction in a figure), this resin is heated in the heating cylinder 21, melting is carried out, and they are \*\* (\*\*) \*\*\*\* to the front of said screw 20.

[0007]If the rotation generated by driving the motor 9 for ejection at the time of an injection process is transmitted to the ball screw shaft 8 via the timing belt 7b, While said ball nut 5a and the support member 5 are advanced with rotation of said ball screw shaft 8 (it moves to the left

in a figure), Said screw 20 is also advanced and the cavity space of the metallic mold device which is not illustrated from the ejection nozzle 21a is filled up with the resin collected ahead of this screw 20.

[0008]And the power, i.e., the ejection power generated on the screw 20, of advancing the ball nut 5a is detected by the load cell 5b at this time.

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## EFFECT OF THE INVENTION

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[Effect of the Invention]In [ according to / as explained to details above / this invention ] an ejection device, A cylinder member and the injection member allocated in this cylinder member enabling a free attitude, It connects with the 1st support member that supports this injection member enabling free rotation, and a driving means relatively to said injection member, enabling free rotation, It has the load detecting means allocated between the 2nd support member that permits the relative rotating of the transmission shaft provided with the rotation transmitting section which rotation of said driving means is delivered, and the movement directional change part which changes rotational movement into a straight-line motion, and said injection member and a transmission shaft, and said 1st support member and the 2nd support member.

[0041]In this case, if rotation of said driving means is transmitted to a transmission shaft via a rotation transmitting section, rotational movement will be changed into a straight-line motion by the movement directional change part, said injection member will be advanced, and ejection will be performed. At this time, ejection power is detected by a load detecting means. And since said load detecting means is allocated between said 1st support member and the 2nd support member, torque is not added to a load detecting means with rotation of an injection member.

Since said load detecting means is connected with a transmission shaft via the 2nd support member, torque is not added to a load detecting means with rotation of a transmission shaft.

[0042]Therefore, detecting accuracy of the ejection power by a load detecting means can be made high.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention]However, in said conventional ejection device 2, since said ejection power is generated with rotating the ball screw shaft 8, the torque corresponding to the screwing angle of the ball screw shaft 8 and the ball nut 5a is added to said ball nut 5a. Therefore, the detecting accuracy of the ejection power by the load cell 5b will become low. [0010]This invention solves the problem of said conventional ejection device, and an object of this invention is to provide the ejection device which can make detecting accuracy of ejection power high.

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## MEANS

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[Means for Solving the Problem]Therefore, an injection member allocated in a cylinder member and this cylinder member in an ejection device of this invention enabling a free attitude, It connects with the 1st support member that supports this injection member enabling free rotation, and a driving means relatively to said injection member, enabling free rotation, It has the load detecting means allocated between the 2nd support member that permits relative rotating of a transmission shaft provided with a rotation transmitting section which rotation of said driving means is delivered, and a movement directional change part which changes rotational movement into a straight-line motion, and said injection member and a transmission shaft, and said 1st support member and the 2nd support member.

[0012]In other ejection devices of this invention, it has further a motor for measuring, and a transmission means which transmits rotation of this motor for measuring to said injection member.

[0013]

[Embodiment of the Invention]Hereafter, it explains in detail, referring to drawings for an embodiment of the invention. Drawing 1 is a sectional view of the built in motor type ejection device in a 1st embodiment of this invention. In a figure, 12 is a heating cylinder as a cylinder member, and the ejection nozzle 12a is allocated by the front end (left end in a figure) of this heating cylinder 12. The screw 22 as an injection member is allocated in said heating cylinder 12, enabling an attitude (it moves to the longitudinal direction in a figure) free [ rotation ] and free. [0014]And while this screw 22 has the screw head 22a in the front end, the inside of said heating cylinder 12 is extended back (right direction in a figure), and the bearing box 13 as 2nd support member is fixed to the back end (right end in a figure). The spiral flight 23 is formed in the circumference of said screw 22, and the slot 26 is formed between these flights 23.

[0015]And the resin supplying port which is not illustrated is formed in the set-up part in said heating cylinder 12, and the hopper which is not illustrated in this resin supplying port is allocated. Said resin supplying port is formed in the part corresponding to the rear end part of said slot 26 in the state where the screw 22 was put on the method of the foremost in the heating cylinder 12 (left in a figure). The heater which is not illustrated is allocated around said heating cylinder 12.

[0016]If only the specified quantity is retreated at the time of a metering process, rotating said screw 22 (it moves to the right direction in a figure), It is supplied in the heating cylinder 12 by which resin of the pellet type was heated with said heater from the inside of said hopper, and melting of this resin is heated and carried out, and it is advanced in the inside of the slot 26 (it moves to the left in a figure). And the resin made to carry out melting for one shot ahead [ of said screw head 22a ] is collected.

[0017]Next, if it is made to move forward at the time of an injection process, without rotating said screw 22, the resin collected ahead of said screw head 22a will be ejected from the ejection nozzle 12a, and the cavity space of the metallic mold device which is not illustrated will be filled up with it. By the way, behind said heating cylinder 12, the actuator 15 for rotating said screw 22 or making it move is allocated. This actuator 15 is provided with the motor 81 for measuring allocated to the frame 17 and this frame 17 enabling free movement, and the motor 82 for

ejection as a driving means fixed to said frame 17, and this motor 82 for ejection and the screw 22 are allocated on the same axis.

[0018]The guide bar 83 prolonged in parallel with said screw 22 is allocated by said frame 17, and said motor 81 for measuring is moved to it along with this guide bar 83. Therefore, while the support plate 84 as 1st support member is allocated to said guide bar 83, enabling free sliding and the motor 81 for measuring is attached to said support plate 84, the follower side belt pulley 88 is supported by the bearing 106, enabling free rotation.

[0019]The driving side pulley 86 is fixed to the output shaft 85 of said motor 81 for measuring, and the timing belt 89 is stretched between this driving side pulley 86 and said follower side belt pulley 88. And the bearing box 13 is attached to the rear face (right face in a figure) of said support plate 84 via the load cell 105 as a load detecting means. A transmission means is constituted by the driving side pulley 86, the follower side belt pulley 88, and the timing belt 89.

[0020]On the other hand, said motor 82 for ejection comprises the rotor 92 allocated in the inner circumference side of the stator 91 fixed to said frame 17, and this stator 91, and this rotor 92 is supported to the frame 17, enabling free rotation. Therefore, the rotor shaft 93 in the air is inserted and fixed to said rotor 92, and the both ends of this rotor shaft 93 are supported by the frame 17 by the bearings 94 and 95, respectively.

[0021]The bearings 96 and 97 are allocated in said bearing box 13, The screw 22, and the ball screw shaft and castellated-shaft unit 98 as a transmission shaft are relatively connected by these bearings 96 and 97, enabling free rotation, The ball nut 99 fixed to said frame 17 and the ball screw shaft part 98a formed in the first portion of said ball screw shaft and castellated-shaft unit 98 are made to screw. The movement directional change part which changes rotational movement into a straight-line motion is constituted by this ball screw shaft part 98a.

[0022]Therefore, the rotation generated by driving said motor 81 for measuring in the metering process, It is transmitted to the driving side pulley 86, the timing belt 89, the follower side belt pulley 88, and the screw 22 in order, while the screw 22 rotates, it is retreated, and resin for one shot is collected ahead of the screw head 22a. In this case, since the screw 22, and a ball screw shaft and a castellated-shaft unit 98 are relatively connected via the support plate 84, the load cell 105, and the bearing box 13, enabling free rotation, Although the rotation transmitted to the follower side belt pulley 88 is not transmitted to a ball screw shaft and the castellated-shaft unit 98, the pressure of resin in the heating cylinder 12 is transmitted to a ball screw shaft and the castellated-shaft unit 98 via the support plate 84, the load cell 105, and the bearing box 13. Therefore, the screw 22 is also retreated by retreating, while a ball screw shaft and the castellated-shaft unit 98 rotate. When retreating this screw 22, the pressure of resin is resisted and back pressure is applied to the screw 22.

[0023]On the other hand, it can be made to move forward by supplying the current of predetermined frequency to the stator 91 in said motor 82 for ejection, without rotating said screw 22. Therefore, the locking member 101 almost annular in the center inside said rotor shaft 93 is fixed, and you are made for the spline 102 formed in the inner circumference of this locking member 101 and the spline shaft part 98b formed in the latter half part of said ball screw shaft and castellated-shaft unit 98 to be engaged. The rotation transmitting section which rotation of the motor 82 for ejection is delivered is constituted by this spline shaft part 98b.

[0024]Therefore, in an injection process, the rotation generated by driving said motor 82 for ejection is transmitted to the rotor shaft 93, the locking member 101, and a ball screw shaft and a castellated-shaft unit 98 in order. And since said ball nut 99 is being fixed to the frame 17, the screw 22 is also advanced by moving forward, while a ball screw shaft and the castellated-shaft unit 98 rotate. At this time, the ejection power generated by the screw 22 is transmitted to the load cell 105 via the follower side belt pulley 88, and is detected by this load cell 105.

[0025]Thus, inertia can be made small while being able to make mechanical efficiency high, since direct transmission of a deceleration mechanism, the belt pulley, etc. is carried out to a ball screw shaft and the castellated-shaft unit 98 via rotation of the motor 82 for ejection. As a result, in an injection process, while being able to shorten time required to start or change an injection speed, torque required to start or change an injection speed can be made small. Time required for the change to a dwelling process from an injection process can be shortened.

[0026]said locking member 101 — the inside of the rotor shaft 93 — since it is mostly allocated in the center, the spline shaft part 98b can be made to move in the inside of the rotor 92 And the driving side pulley 86 for transmitting rotation of the motor 81 for measuring to the screw 22, the follower side belt pulley 88, and the timing belt 89 can be allocated in piles with the bearing box 13 in shaft orientations. Therefore, the axial dimension of a built in motor type ejection device can be made small.

[0027]And since said load cell 105 is attached to the support plate 84, torque is not added to the load cell 105 with rotation of the screw 22 and the follower side belt pulley 88. Since said load cell 105 is connected with a ball screw shaft and the castellated-shaft unit 98 via the bearing box 13, torque is not added to the load cell 105 with rotation of a ball screw shaft and the castellated-shaft unit 98.

[0028]Therefore, detecting accuracy of the ejection power by the load cell 105 can be made high. Next, a 2nd embodiment of this invention is described. Drawing 3 is a sectional view of the built in motor type ejection device in a 2nd embodiment of this invention.

[0029]In a figure, the water cooled jacket in which 181 was attached to the front plate and 182 was attached to this front plate 181, and 223 are rear cases, and this rear case 223 comprises the wrap end plates 224 and 225 in the both ends of the tubed part 226 and this tubed part 226. The motor 145 for ejection as a driving means is allocated in said rear case 223.

[0030]And the screw which is not illustrated as an injection member and the guide bar 183 prolonged in parallel are allocated between the front plate 181 and the end plate 224, and the motor 201 for measuring is moved along with this guide bar 183. Therefore, the support plate 184 as 1st support member is allocated to said guide bar 183, enabling free sliding, and the motor 201 for measuring is attached to said support plate 184. It is allocated on a different parallel axis from this motor 201 for measuring, and said screw, and said motor 145 for ejection and said screw are allocated on the same axis.

[0031]The driving-side gear 203 is attached to the output shaft 202 of said motor 201 for measuring, and, as for \*\* (\*\*), this driving-side gear 203 and the idle gear 204 supported by the front case which is not illustrated enabling free rotation are put together. And the follower side gear 205 is allocated by said support plate 184 via the bearings 213 and 214, enabling free rotation, and said idle gear 204 gear with said follower side gear 205. Therefore, the rotation generated by driving said motor 201 for measuring is transmitted to the rod 114 via the driving-side gear 203, the idle gear 204, and the follower side gear 205. A transmission means is constituted by the driving-side gear 203, the idle gear 204, and the follower side gear 205.

[0032]The bearing box 231 as 2nd support member is allocated in the rear face (right face in a figure) of said support plate 184 via the load cell 105 as a load detecting means. And it can be made to move forward by driving said motor 145 for ejection, without rotating said screw (it moves to the left in a figure). Therefore, the bearings 166 and 167 and the thrust bearing 168 are allocated in said bearing box 231. The front end (left end in a figure) of the ball screw shaft and the castellated-shaft unit 165 as a transmission shaft is supported by said bearings 166 and 167, enabling free rotation, and thrust loading can receive by said thrust bearing 168. The ball nut 169 is fixed to the front face (left surface in a figure) of said end plate 224, and this ball nut 169 and the ball screw shaft part 123 formed in the first portion of a ball screw shaft and the castellated-shaft unit 165 are made to screw. The movement directional change part which changes rotational movement into a straight-line motion is constituted by this ball screw shaft part 123 and the ball nut 169.

[0033]The tubed locking member 121 is attached to the back end (right end in a figure) of the rotor shaft 157, and it extends from the rear end part of said rotor shaft 157, applying this locking member 121 in the center mostly, and the spline 122 is formed in the front end of inner circumference. And spline connection of said locking member 121 and the spline shaft part 124 formed in the latter half part of a ball screw shaft and the castellated-shaft unit 165 is carried out via this spline 122. Namely, a ball screw shaft and the castellated-shaft unit 165 are supported by the bearing box 231 by the bearings 153 and 154 via the locking member 121 and the rotor shaft 157 in the back end in the front end, enabling respectively free rotation. The rotation transmitting section which rotation of the motor 145 for ejection is delivered is

constituted by said spline shaft part 124.

[0034]And the end cap 131 is fixed to the back end of said rotor shaft 157, this end cap 131 seals the inside of said rotor shaft 157, and the foreign matter etc. which are not illustrated in the rotor shaft 157 are prevented from advancing. The encoder 132 is attached to said end cap 131, and direct detection of the number of rotations of a ball screw shaft and the castellated-shaft unit 165 is carried out by this encoder 132. Therefore, in the control section which is not illustrated, the position of a ball screw shaft and the castellated-shaft unit 165 is computable based on the number of rotations of said ball screw shaft and castellated-shaft unit 165.

[0035]In this case, rotation of the rotor 149 is transmitted to a ball screw shaft and the castellated-shaft unit 165 via the rotor shaft 157 and the locking member 121, Rotational movement is changed into a straight-line motion by said ball screw shaft part 123 and the ball nut 169, and a ball screw shaft and the castellated-shaft unit 165 are made to move with them. Therefore, by driving said motor 145 for ejection and rotating the rotor 149, a ball screw shaft and the castellated-shaft unit 165 can be advanced, and a screw can be advanced. Thus, it can eject. 148 is a stator.

[0036]Next, operation of the ejection device of said composition is explained. First, the rotation generated by driving said motor 201 for measuring in the metering process, It is transmitted to the driving-side gear 203, the idle gear 204, the follower side gear 205, the rod 114, and a screw in order, while a screw rotates, it is retreated, and it is accumulated ahead of [ resin for one shot is not illustrated ] a screw head. In this case, since the screw, and a ball screw shaft and a castellated-shaft unit 165 are relatively connected via the rod 114, the follower side gear 205, the support plate 184, the load cell 105, and the bearing box 231, enabling free rotation, Although the rotation transmitted to the follower side gear 205 is not transmitted to a ball screw shaft and the castellated-shaft unit 165, The pressure of resin in the heating cylinder which is not illustrated is transmitted to a ball screw shaft and the castellated-shaft unit 165 via the rod 114, the follower side gear 205, the support plate 184, the load cell 105, and the bearing box 231. Therefore, a screw is also retreated by retreating, while a ball screw shaft and the castellated-shaft unit 165 rotate (it moves to the right direction in a figure). When retreating this screw, the pressure of resin is resisted and back pressure is applied to a screw.

[0037]On the other hand, in an injection process, the rotation rotated by driving said motor 145 for ejection is transmitted to the rotor shaft 157, the locking member 121, and a ball screw shaft and a castellated-shaft unit 165 in order. And since said ball nut 169 is being fixed to the end plate 224, a screw is also advanced by moving forward, while a ball screw shaft and the castellated-shaft unit 165 rotate.

[0038]In this embodiment, since said load cell 105 is attached to the support plate 184, torque is not added to the load cell 105 with rotation of a screw and the follower side gear 205. Since said load cell 105 is connected with a ball screw shaft and the castellated-shaft unit 165 via the bearing box 231, torque is not added to the load cell 105 with rotation of a ball screw shaft and the castellated-shaft unit 165.

[0039]Therefore, detecting accuracy of the ejection power by the load cell 105 can be made high. In said each embodiment, although the screw is used as an injection member, it can replace with a screw and a plunger can also be used. This invention is not limited to said embodiment, and it is possible to make it change variously based on the meaning of this invention, and it does not eliminate them from the range of this invention.

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[Translation done.]

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1]It is a sectional view of the built in motor type ejection device in a 1st embodiment of this invention.

[Drawing 2]It is a schematic diagram of the ejection device of the conventional electromotive injection molding machine.

[Drawing 3]It is a sectional view of the built in motor type ejection device in a 2nd embodiment of this invention.

[Description of Notations]

12 Heating cylinder

13 and 231 Bearing box

22 Screw

81 and 201 Motor for measuring

82 and 145 Motor for ejection

84 and 184 Support plate

86 Driving side pulley

88 Follower side belt pulley

89 Timing belt

98, 165 ball screw shafts and a castellated-shaft unit

98a, 123 ball screw shaft parts

98b, 124 spline shaft parts

99 and 169 Ball nut

105 Load cell

203 Driving-side gear

204 Idle gear

205 Follower side gear

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[Translation done.]

## \* NOTICES \*

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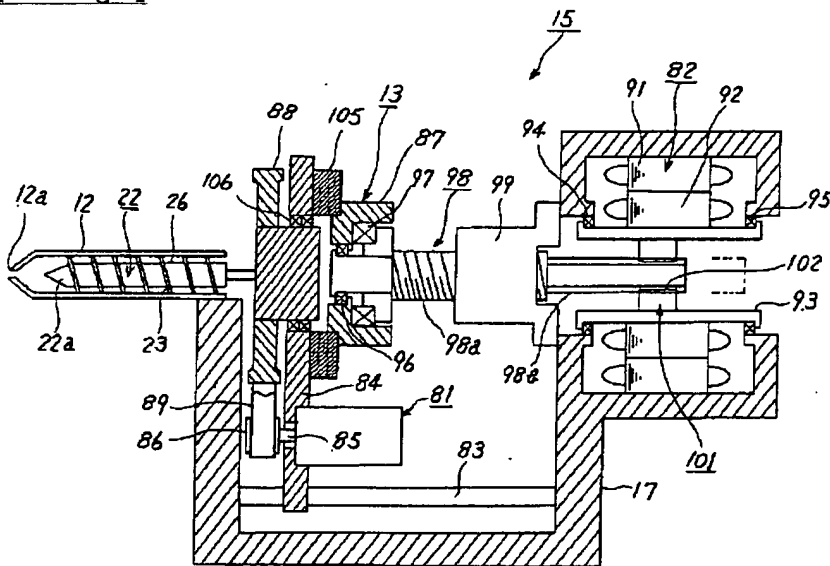
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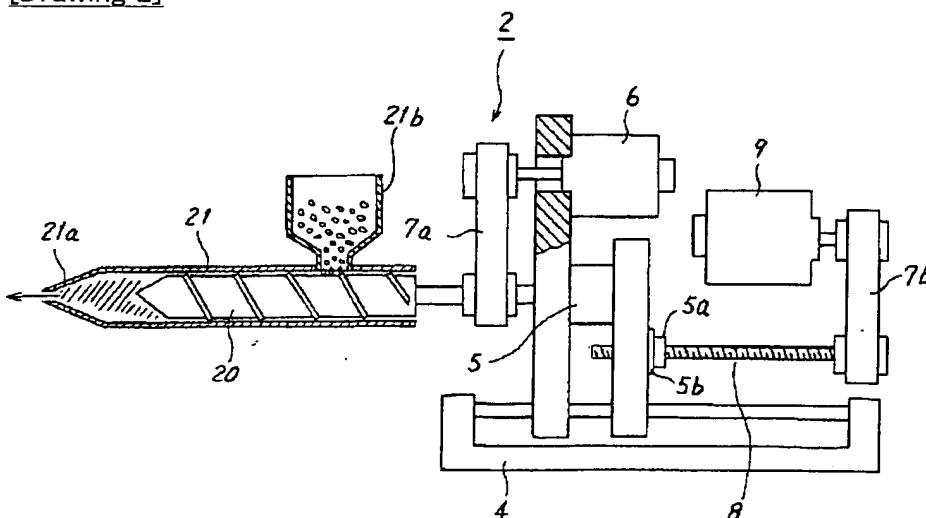
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## DRAWINGS

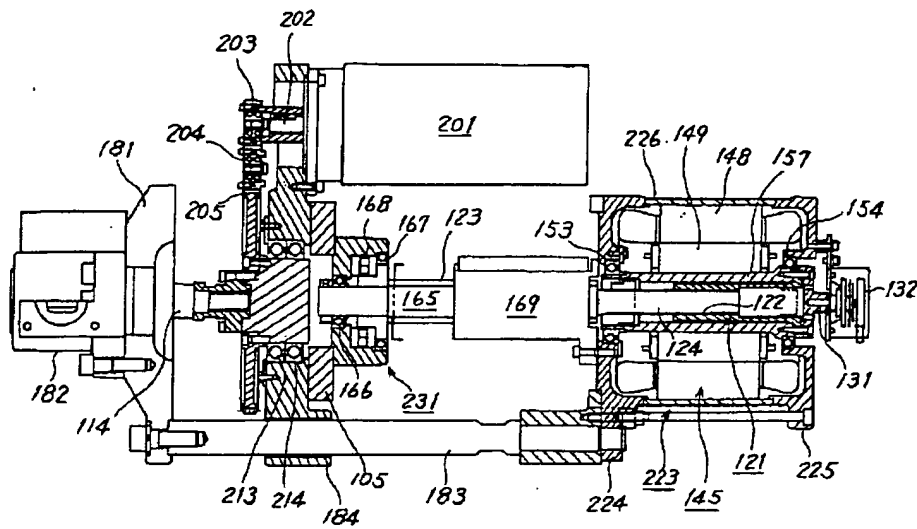
[Drawing 1]



[Drawing 2]



[Drawing 3]



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(71)出願人 000002107

住友重機械工業株式会社

東京都品川区北品川五丁目9番11号

(72) 発明者 江本 敦史

千葉県千葉市稲毛区長沼原町731番地の1

住友重機械工業株式会社千葉製造所内

(74) 代理人 100096426

弁理士 川合 誠 (外1名)

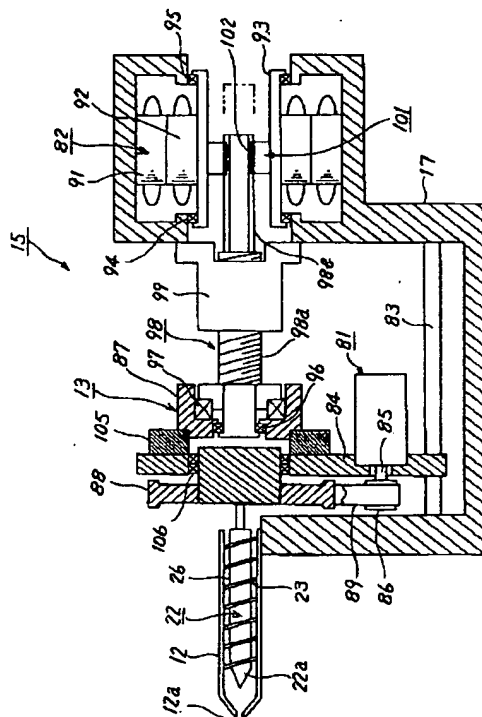
Fターム(参考) 4F206 AP20 JA07 JT02 JT32 JT38

(54) 【発明の名称】 射出装置

(57) 【要約】

【課題】射出力の検出精度を高くすることができるようにする。

【解決手段】 シリンダ部材内において進退自在に配設された射出部材と、該射出部材を回転自在に支持する第1の支持部材と、駆動手段と、前記射出部材に対して相対的に回転自在に連結され、前記駆動手段の回転が伝達される回転伝達部、及び回転運動を直線運動に変換する運動方向変換部を備えた伝動軸と、前記射出部材と伝動軸との相対回転を許容する第2の支持部材と、前記第1の支持部材と第2の支持部材との間に配設された荷重検出手段とを有する。該荷重検出手段は、第1の支持部材と第2の支持部材との間に配設されるので、射出部材の回転に伴ってトルクが加わることはない。前記荷重検出手段は第2の支持部材を介して伝動軸と連結されるので、伝動軸の回転に伴ってトルクが加わることはない。



## 【特許請求の範囲】

【請求項 1】 (a) シリンダ部材と、(b) 該シリンダ部材内において進退自在に配設された射出部材と、

(c) 該射出部材を回転自在に支持する第 1 の支持部材と、(d) 駆動手段と、(e) 前記射出部材に対して相対的に回転自在に連結され、前記駆動手段の回転が伝達される回転伝達部、及び回転運動を直線運動に変換する運動方向変換部を備えた伝動軸と、(f) 前記射出部材と伝動軸との相対回転を許容する第 2 の支持部材と、

(g) 前記第 1 の支持部材と第 2 の支持部材との間に配設された荷重検出手段とを有することを特徴とする射出装置。

【請求項 2】 (a) 計量用モータと、(b) 該計量用モータの回転を前記射出部材に伝達する伝動手段とを有する請求項 1 に記載の射出装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、射出装置に関するものである。

## 【0002】

【従来の技術】従来、射出成形機においては、加熱シリンダ内において加熱され溶融させられた樹脂を、高圧で射出し、金型装置のキャビティ空間に充填（てん）し、該キャビティ空間内において冷却して固化させることによって成形品を得ることができるようになっている。

【0003】前記射出成形機は型締装置及び射出装置を有し、前記型締装置は、固定プラテン及び可動プラテンを備え、型締用シリンダが可動プラテンを進退させることによって型閉じ、型締め及び型開きを行う。一方、前記射出装置は、ホoppaから供給された樹脂を加熱して溶融させる加熱シリンダ、及び溶融させられた樹脂を射出する射出ノズルを備え、前記加熱シリンダ内にスクリーが回転自在に、かつ、進退自在に配設される。そして、該スクリーを前進させることによって射出ノズルから樹脂が射出され、スクリーを後退させることによって樹脂の計量が行われる。

【0004】ところで、前記スクリーを進退させるために、電動機を使用した電動射出成形機の射出装置が提供されている。図 2 は従来の電動射出成形機の射出装置の概略図である。図において、2 は射出装置、4 は射出装置フレームであり、該射出装置フレーム 4 の前方（図における左方）には加熱シリンダ 21 が固定され、該加熱シリンダ 21 の前端（図における左端）に射出ノズル 21 a が配設される。そして、前記加熱シリンダ 21 にはホoppa 21 b が配設されるとともに、加熱シリンダ 21 内にはスクリー 20 が回転自在に、かつ、進退（図における左右方向に移動）自在に配設され、該スクリー 20 の後端（図における右端）が支持部材 5 によって回転自在に支持される。

【0005】該支持部材 5 には減速機構付きの計量用モ

ータ 6 が取り付けられ、該計量用モータ 6 の回転がタイミングベルト 7 a を介して前記スクリー 20 に伝達されるようになっている。また、スクリー 20 と平行にボールねじ軸 8 が回転自在に支持されるとともに、該ボールねじ軸 8 の後端はタイミングベルト 7 b を介して減速機構付きの射出用モータ 9 に連結され、該射出用モータ 9 によってボールねじ軸 8 を回転させることができるようになっている。そして、該ボールねじ軸 8 の前端は支持部材 5 に固定されたボールナット 5 a と螺（ら）合させられる。したがって、前記射出用モータ 9 を駆動し、タイミングベルト 7 b を介してボールねじ軸 8 を回転させることによって、ボールナット 5 a を軸方向に移動させることができる。なお、前記支持部材 5 とボールナット 5 a との間にロードセル 5 b が配設される。

【0006】前記構成の射出装置 2 においては、計量工程時に、計量用モータ 6 を駆動することによって発生させられた回転が、タイミングベルト 7 a を介してスクリー 20 に伝達されると、該スクリー 20 が所定量だけ後退（図における右方に移動）させられるとともに、ホoppa 21 b 内から樹脂が供給され、該樹脂は、加熱シリンダ 21 内において加熱され溶融させられ、前記スクリー 20 の前方に溜（た）められる。

【0007】また、射出工程時に、射出用モータ 9 を駆動することによって発生させられた回転が、タイミングベルト 7 b を介してボールねじ軸 8 に伝達されると、前記ボールナット 5 a 及び支持部材 5 が前記ボールねじ軸 8 の回転に伴って前進（図における左方に移動）させられるとともに、前記スクリー 20 も前進させられ、該スクリー 20 の前方に溜められた樹脂は射出ノズル 21 a から図示されない金型装置のキャビティ空間に充填される。

【0008】そして、このとき、ボールナット 5 a を前進させる力、すなわち、スクリー 20 に発生する射出力は、ロードセル 5 b によって検出される。

## 【0009】

【発明が解決しようとする課題】しかしながら、前記従来の射出装置 2 において、前記射出力はボールねじ軸 8 を回転させるのに伴って発生させられるので、前記ボールナット 5 a にボールねじ軸 8 とボールナット 5 a との螺合角度に対応するトルクが加わる。したがって、ロードセル 5 b による射出力の検出精度が低くなってしまう。

【0010】本発明は、前記従来の射出装置の問題点を解決して、射出力の検出精度を高くすることができる射出装置を提供することを目的とする。

## 【0011】

【課題を解決するための手段】そのために、本発明の射出装置においては、シリンダ部材と、該シリンダ部材内において進退自在に配設された射出部材と、該射出部材を回転自在に支持する第 1 の支持部材と、駆動手段と、

前記射出部材に対して相対的に回転自在に連結され、前記駆動手段の回転が伝達される回転伝達部、及び回転運動を直線運動に変換する運動方向変換部を備えた伝動軸と、前記射出部材と伝動軸との相対回転を許容する第2の支持部材と、前記第1の支持部材と第2の支持部材との間に配設された荷重検出手段とを有する。

【0012】本発明の他の射出装置においては、さらに、計量用モータと、該計量用モータの回転を前記射出部材に伝達する伝動手段とを有する。

【0013】

【発明の実施の形態】以下、本発明の実施の形態について図面を参照しながら詳細に説明する。図1は本発明の第1の実施の形態におけるビルトインモータ型射出装置の断面図である。図において、12はシリンダ部材としての加熱シリンダであり、該加熱シリンダ12の前端（図における左端）に射出ノズル12aが配設される。前記加熱シリンダ12内には、射出部材としてのスクリュウ22が回転自在に、かつ、進退（図における左右方向に移動）自在に配設される。

【0014】そして、該スクリュウ22は、前端にスクリュウヘッド22aを有するとともに、前記加熱シリンダ12内を後方（図における右方）に延び、後端（図における右端）に第2の支持部材としてのベアリングボックス13が固定される。また、前記スクリュウ22の周囲には螺旋状のフライト23が形成され、該フライト23間に溝26が形成される。

【0015】そして、前記加熱シリンダ12における設定された箇所には図示されない樹脂供給口が形成され、該樹脂供給口に図示されないホoppが配設される。前記樹脂供給口は、スクリュウ22を加熱シリンダ12内における最も前方（図における左方）に置いた状態において、前記溝26の後端部に対応する箇所に形成される。また、前記加熱シリンダ12の周囲には図示されないヒータが配設される。

【0016】計量工程時に、前記スクリュウ22を回転させながら所定量だけ後退（図における右方に移動）させると、前記ホopp内からペレット状の樹脂が前記ヒータによって加熱された加熱シリンダ12内に供給され、該樹脂は加熱され融融させられて溝26内を前進（図における左方に移動）させられる。そして、前記スクリュウヘッド22aの前方に1ショット分の融融させられた樹脂が溜められる。

【0017】次に、射出工程時に、前記スクリュウ22を回転させることなく前進させると、前記スクリュウヘッド22aの前方に溜められた樹脂は、射出ノズル12aから射出され、図示されない金型装置のキャビティ空間に充填される。ところで、前記加熱シリンダ12の後方には、前記スクリュウ22を回転させたり進退させたりするための駆動部15が配設される。該駆動部15は、フレーム17、該フレーム17に対して移動自在に

配設された計量用モータ81、及び前記フレーム17に固定された駆動手段としての射出用モータ82を備え、該射出用モータ82とスクリュウ22とが同一軸上に配設される。

【0018】前記フレーム17には、前記スクリュウ22と平行に延びる案内バー83が配設され、該案内バー83に沿って前記計量用モータ81が移動させられる。そのために、第1の支持部材としての支持板84が前記案内バー83に対して摺（しゅう）動自在に配設され、前記支持板84に計量用モータ81が取り付けられるとともに、従動側プーリ88がベアリング106によって回転自在に支持される。

【0019】また、前記計量用モータ81の出力軸85に駆動側プーリ86が固定され、該駆動側プーリ86と前記従動側プーリ88との間にタイミングベルト89が張設される。そして、前記支持板84の後面（図における右面）に、荷重検出手段としてのロードセル105を介してベアリングボックス13が取り付けられる。なお、駆動側プーリ86、従動側プーリ88及びタイミングベルト89によって伝動手段が構成される。

【0020】一方、前記射出用モータ82は、前記フレーム17に固定されたステータ91、及び該ステータ91の内周側に配設されたロータ92から成り、該ロータ92はフレーム17に対して回転自在に支持される。そのために、前記ロータ92に中空のロータシャフト93が嵌（かん）入されて固定され、該ロータシャフト93の両端がベアリング94、95によってフレーム17にそれぞれ支持される。

【0021】また、前記ベアリングボックス13内にベアリング96、97が配設され、該ベアリング96、97によってスクリュウ22と伝動軸としてのボールねじ軸・スプライン軸ユニット98とが相対的に回転自在に連結され、前記フレーム17に固定されたボールナット99と前記ボールねじ軸・スプライン軸ユニット98の前半部に形成されたボールねじ軸部98aとが螺合させられる。なお、該ボールねじ軸部98aによって、回転運動を直線運動に変換する運動方向変換部が構成される。

【0022】したがって、計量工程において、前記計量用モータ81を駆動することによって発生させられた回転が、駆動側プーリ86、タイミングベルト89、従動側プーリ88及びスクリュウ22に順に伝達され、スクリュウ22が回転されながら後退させられて、1ショット分の樹脂がスクリュウヘッド22aの前方に溜められる。この場合、スクリュウ22とボールねじ軸・スプライン軸ユニット98とは支持板84、ロードセル105及びベアリングボックス13を介して相対的に回転自在に連結されているので、従動側プーリ88に伝達された回転はボールねじ軸・スプライン軸ユニット98には伝達されないが、加熱シリンダ12内の樹脂の圧力が支持

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板 84、ロードセル 105 及びベアリングボックス 13 を介してボールねじ軸・スプライン軸ユニット 98 に伝達される。したがって、ボールねじ軸・スプライン軸ユニット 98 が回転しながら後退することによってスクリュウ 22 も後退させられる。なお、該スクリュウ 22 を後退させるときに、樹脂の圧力に抗してスクリュウ 22 に背圧が加えられる。

【0023】一方、前記射出用モータ 82 において、ステータ 91 に所定の周波数の電流を供給することによって、前記スクリュウ 22 を回転させることなく前進させることができる。そのために、前記ロータシャフト 93 の内側のほぼ中央に環状の係止部材 101 が固定され、該係止部材 101 の内周に形成されたスプライン 102 と前記ボールねじ軸・スプライン軸ユニット 98 の後半部に形成されたスプライン軸部 98b とが係合させられる。なお、該スプライン軸部 98b によって、射出用モータ 82 の回転が伝達される回転伝達部が構成される。

【0024】したがって、射出工程において、前記射出用モータ 82 を駆動することによって発生させられた回転が、ロータシャフト 93、係止部材 101 及びボールねじ軸・スプライン軸ユニット 98 に順に伝達される。そして、前記ボールナット 99 がフレーム 17 に固定されているので、ボールねじ軸・スプライン軸ユニット 98 が回転しながら前進することによってスクリュウ 22 も前進させられる。また、このとき、スクリュウ 22 に発生させられる射出力は、従動側プーリ 88 を介してロードセル 105 に伝達され、該ロードセル 105 によって検出される。

【0025】このように、射出用モータ 82 の回転が減速機構、プーリ等を介することなくボールねじ軸・スプライン軸ユニット 98 に直接伝達されるようになっているので、機械効率を高くすることができるとともに、イナーシャを小さくすることができる。その結果、射出工程において、射出速度を立ち上げたり、変更したりするのに必要な時間を短くすることができるとともに、射出速度を立ち上げたり、変更したりするのに必要なトルクを小さくすることができる。また、射出工程から保圧工程への切換えに必要な時間を短くすることができる。

【0026】また、前記係止部材 101 がロータシャフト 93 の内側のほぼ中央に配設されるので、ロータ 92 の内側においてスプライン軸部 98b を進退させることができる。そして、計量用モータ 81 の回転をスクリュウ 22 に伝達するための駆動側プーリ 86、従動側プーリ 88 及びタイミングベルト 89 を、軸方向においてベアリングボックス 13 と重ねて配設することができる。したがって、ビルトインモータ型射出装置の軸方向寸法を小さくすることができる。

【0027】そして、前記ロードセル 105 は支持板 84 に取り付けられるので、スクリュウ 22 及び従動側プーリ 88 の回転に伴ってロードセル 105 にトルクが加

わることはない。また、前記ロードセル 105 はベアリングボックス 13 を介してボールねじ軸・スプライン軸ユニット 98 と連結されるので、ボールねじ軸・スプライン軸ユニット 98 の回転に伴ってロードセル 105 にトルクが加わることはない。

【0028】したがって、ロードセル 105 による射出力の検出精度を高くすることができる。次に、本発明の第 2 の実施の形態について説明する。図 3 は本発明の第 2 の実施の形態におけるビルトインモータ型射出装置の断面図である。

【0029】図において、181 はフロントプレート、182 は該フロントプレート 181 に取り付けられた水冷ジャケット、223 はリヤケースであり、該リヤケース 223 は、筒状部 226 及び該筒状部 226 の両端を覆うエンドプレート 224、225 から成る。前記リヤケース 223 内に駆動手段としての射出用モータ 145 が配設される。

【0030】そして、フロントプレート 181 とエンドプレート 224 との間に、射出部材としての図示されないスクリュウと平行に延びる案内バー 183 が配設され、該案内バー 183 に沿って計量用モータ 201 が移動させられる。そのために、第 1 の支持部材としての支持板 184 が前記案内バー 183 に対して摺動自在に配設され、前記支持板 184 に計量用モータ 201 が取り付けられる。なお、該計量用モータ 201 と前記スクリュウとは異なる平行な軸上に配設され、前記射出用モータ 145 と前記スクリュウとは同一軸上に配設される。

【0031】また、前記計量用モータ 201 の出力軸 202 に駆動側ギヤ 203 が取り付けられ、該駆動側ギヤ 203 と図示されないフロントケースに回転自在に支持されたアイドルギヤ 204 とが噛（し）合される。そして、前記支持板 184 に従動側ギヤ 205 がベアリング 213、214 を介して回転自在に配設され、前記従動側ギヤ 205 と前記アイドルギヤ 204 とが噛合される。したがって、前記計量用モータ 201 を駆動することによって発生させられた回転は、駆動側ギヤ 203、アイドルギヤ 204 及び従動側ギヤ 205 を介してロッド 114 に伝達される。なお、駆動側ギヤ 203、アイドルギヤ 204 及び従動側ギヤ 205 によって伝動手段が構成される。

【0032】また、前記支持板 184 の後面（図における右面）に、荷重検出手段としてのロードセル 105 を介して第 2 の支持部材としてのベアリングボックス 231 が配設される。そして、前記射出用モータ 145 を駆動することによって、前記スクリュウを回転させることなく前進（図における左方に移動）させることができる。そのために、前記ベアリングボックス 231 内にベアリング 166、167 及びスラストベアリング 168 が配設され、前記ベアリング 166、167 によって伝動軸としてのボールねじ軸・スプライン軸ユニット 16

5の前端(図における左端)が回転自在に支持され、前記スラストベ어링168によってスラスト荷重が受けられる。また、前記エンドプレート224の前面(図における左面)にボールナット169が固定され、該ボールナット169とボールねじ軸・スプライン軸ユニット165の前半部に形成されたボールねじ軸部123とが螺合させられる。なお、該ボールねじ軸部123及びボールナット169によって、回転運動を直線運動に変換する運動方向変換部が構成される。

【0033】また、ロータシャフト157の後端(図における右端)に筒状の係止部材121が取り付けられ、該係止部材121は、前記ロータシャフト157の後端部からほぼ中央にかけて延び、内周の前端にスプライン122が形成される。そして、該スプライン122を介して前記係止部材121とボールねじ軸・スプライン軸ユニット165の後半部に形成されたスプライン軸部124とがスプライン連結される。すなわち、ボールねじ軸・スプライン軸ユニット165は、前端において、ベアリングボックス231によって、後端において、係止部材121及びロータシャフト157を介してベアリング153、154によってそれぞれ回転自在に支持される。なお、前記スプライン軸部124によって、射出用モータ145の回転が伝達される回転伝達部が構成される。

【0034】そして、前記ロータシャフト157の後端にはエンドキャップ131が固定され、該エンドキャップ131は前記ロータシャフト157内を密閉し、ロータシャフト157内に図示されない異物等が進入するのを防止する。さらに、前記エンドキャップ131にエンコーダ132が取り付けられ、該エンコーダ132によってボールねじ軸・スプライン軸ユニット165の回転数が直接検出される。したがって、図示されない制御部において、前記ボールねじ軸・スプライン軸ユニット165の回転数に基づいてボールねじ軸・スプライン軸ユニット165の位置を算出することができる。

【0035】この場合、ロータ149の回転は、ロータシャフト157及び係止部材121を介してボールねじ軸・スプライン軸ユニット165に伝達され、前記ボールねじ軸部123及びボールナット169によって回転運動が直線運動に変換され、ボールねじ軸・スプライン軸ユニット165が進退させられる。したがって、前記射出用モータ145を駆動してロータ149を回転させることによって、ボールねじ軸・スプライン軸ユニット165を前進させ、スクリューを前進させることができる。このようにして、射出を行うことができる。なお、148はステータである。

【0036】次に、前記構成の射出装置の動作について説明する。まず、計量工程において、前記計量用モータ201を駆動することによって発生させられた回転が、駆動側ギヤ203、アイドルギヤ204、従動側ギヤ2

05、ロッド114及びスクリューに順に伝達され、スクリューが回転されながら後退させられて、1ショット分の樹脂が図示されないスクリューヘッドの前方に溜められる。この場合、スクリューとボールねじ軸・スプライン軸ユニット165とはロッド114、従動側ギヤ205、支持板184、ロードセル105及びベアリングボックス231を介して相対的に回転自在に連結されているので、従動側ギヤ205に伝達された回転はボールねじ軸・スプライン軸ユニット165には伝達されないが、図示されない加熱シリンダ内の樹脂の圧力がロッド114、従動側ギヤ205、支持板184、ロードセル105及びベアリングボックス231を介してボールねじ軸・スプライン軸ユニット165に伝達される。したがって、ボールねじ軸・スプライン軸ユニット165が回転しながら後退(図における右方に移動)することによってスクリューも後退させられる。なお、該スクリューを後退させるときに、樹脂の圧力に抗してスクリューに背圧が加えられる。

【0037】一方、射出工程においては、前記射出用モータ145を駆動することによって回転させられた回転が、ロータシャフト157、係止部材121及びボールねじ軸・スプライン軸ユニット165に順に伝達される。そして、前記ボールナット169がエンドプレート224に固定されているので、ボールねじ軸・スプライン軸ユニット165が回転しながら前進することによってスクリューも前進させられる。

【0038】本実施の形態においては、前記ロードセル105が支持板184に取り付けられるので、スクリュー及び従動側ギヤ205の回転に伴ってロードセル105にトルクが加わることはない。また、前記ロードセル105はベアリングボックス231を介してボールねじ軸・スプライン軸ユニット165と連結されるので、ボールねじ軸・スプライン軸ユニット165の回転に伴ってロードセル105にトルクが加わることはない。

【0039】したがって、ロードセル105による射出力の検出精度を高くすることができる。前記各実施の形態においては、射出部材としてスクリューを使用しているが、スクリューに代えてプランジャを使用することもできる。なお、本発明は前記実施の形態に限定されるものではなく、本発明の趣旨に基づいて種々変形させることが可能であり、それらを本発明の範囲から排除するものではない。

【0040】

【発明の効果】以上詳細に説明したように、本発明によれば、射出装置においては、シリンダ部材と、該シリンダ部材内において進退自在に配設された射出部材と、該射出部材を回転自在に支持する第1の支持部材と、駆動手段と、前記射出部材に対して相対的に回転自在に連結され、前記駆動手段の回転が伝達される回転伝達部、及び回転運動を直線運動に変換する運動方向変換部を備え

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た伝動軸と、前記射出部材と伝動軸との相対回転を許容する第2の支持部材と、前記第1の支持部材と第2の支持部材との間に配設された荷重検出手段とを有する。

【0041】この場合、前記駆動手段の回転が回転伝達部を介して伝動軸に伝達されると、運動方向変換部によって回転運動が直線運動に変換され、前記射出部材が前進させられて射出が行われる。このとき、荷重検出手段によって射出力が検出される。そして、前記荷重検出手段は、前記第1の支持部材と第2の支持部材との間に配設されるので、射出部材の回転に伴って荷重検出手段にトルクが加わることはない。また、前記荷重検出手段は第2の支持部材を介して伝動軸と連結されるので、伝動軸の回転に伴って荷重検出手段にトルクが加わることはない。

【0042】したがって、荷重検出手段による射出力の検出精度を高くすることができる。

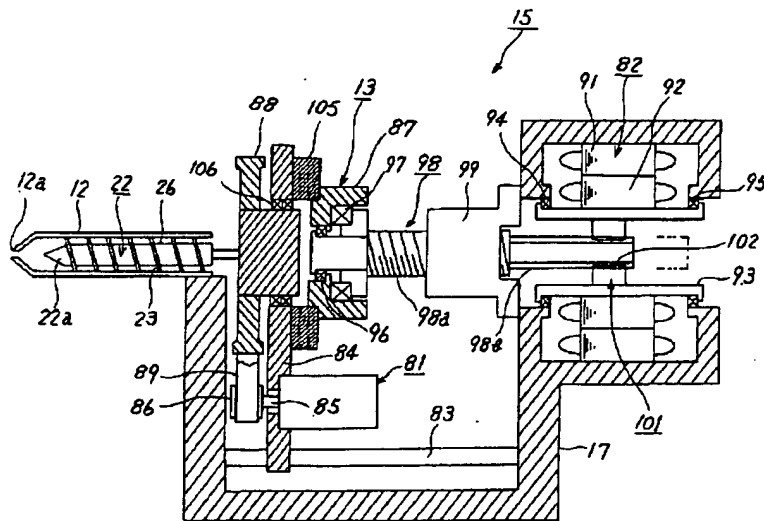
#### 【図面の簡単な説明】

【図1】本発明の第1の実施の形態におけるビルトインモータ型射出装置の断面図である。

【図2】従来の電動射出成形機の射出装置の概略図である。

\*

【図1】

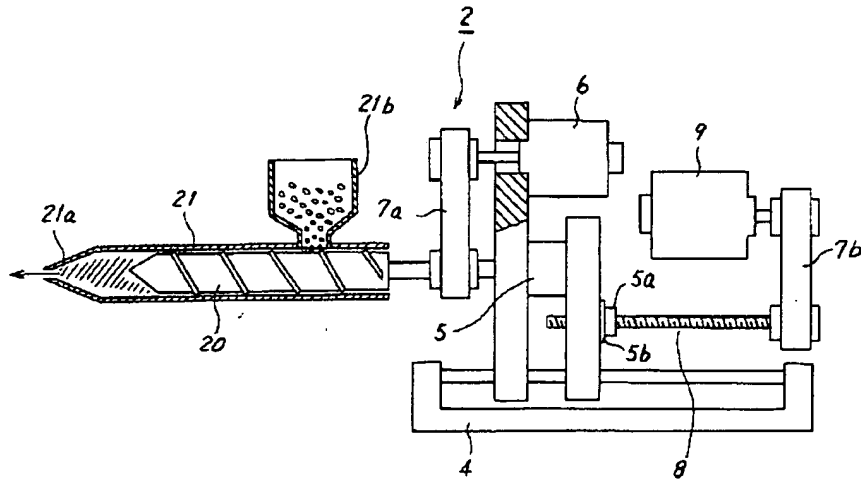


\* 【図3】本発明の第2の実施の形態におけるビルトインモータ型射出装置の断面図である。

#### 【符号の説明】

- 12 加熱シリンダ
- 13、231 ベアリングボックス
- 22 スクリュー
- 81、201 計量用モータ
- 82、145 射出用モータ
- 84、184 支持板
- 86 駆動側プーリ
- 88 従動側プーリ
- 89 タイミングベルト
- 98、165 ボールねじ軸・スプライン軸ユニット
- 98a、123 ボールねじ軸部
- 98b、124 スプライン軸部
- 99、169 ボールナット
- 105 ロードセル
- 203 駆動側ギヤ
- 204 アイドルギヤ
- 205 従動側ギヤ

【図 2】



【図 3】

